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ABSTRACT

Education is a team sport. Current developments in cognitive, social and educational psychology suggest the potential pedagogical value of adopting "a group perspective." Over the last few years, the Air Force Academy has examined the effects of several classroom interventions intended to develop and harness the power of groups to improve students' educational experiences and attitudes. In general, results suggest these interventions enhanced overall academic achievement, reduced within-section performance variance, increased student interest in subject matter, and helped establish mutual respect and positive relations among students. (Author)

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Educating from a group perspective: what, why and how

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"What a person thinks on his own, without being stimulated by the thoughts of others, is, even in the best case, rather paultry and monotonous" - Albert Einstein (in Winokur, 1984, p. 106). Einstein also made his disdain for traditional approaches to education clear: "The crippling of individuals is the worst evil of our educational system. An exaggerated competitive attitude is inculcated into the student, who is trained to worship aquisitive success..." (in Seldes, 1985, p. 223). Current developments in cognitive and social psychology support Einstein's candid observations. These developments suggest our perspective on education should be broadened to include interpersonal, group and organizational factors.

Education: What?

When the term "education" is mentioned, most of us would have little difficulty conjuring up a plethora of images. Neatly aligned desks with squeaky hinged tops, slightly streaked green chalkboards proferring battered erasers and broken chalk, teachers glowering at recently rowdy students and a plastic wall clock with a propensity for stretching minutes beyond the limits of either equity or nature are part of my personal panoply of "education" images. Perhaps your images are similar; perhaps not. "Education" is a common but complex term which invites personal interpretation and definition based on unique experience or particular purpose. One consequence of this ad hoc approach to defining education is that we have come to accept the term even in its most superficial sense. We also accept generalizations from the observance of limited phenomena as compelling support for basic educational principles. For many of us, this approach to understanding education reflects our scientific training; we've learned to simplify and observe.

Unfortunately, simplification itself leads us to ignore many educational factors. Researchers selected independent variables which were readily manipulated and outcomes which could be quantified objectively. Education was evaluated (and thus defined) only in terms of well-specified individual behaviors in highly-circumscribed, well-controlled situations. This path was the one most likely to yield reliable data expeditiously. The path of least resistance, however, has led downhill. Without conceptual anchors, immediate concerns for objective, reliable, (i.e., publishable) data overshadowed concern for general validity or theoretical coherence. Much of the educational research over the last half century has been tantamount to searching for the ideal lounge chair arrangement for the deck of the Titanic.

This was clearly not the intent of researchers, so what happened? Operationally speaking, education was reduced to a point where it was indistinguishable from training. Training is any series of procedures or treatments designed to bring about desired behaviors (Wolman, 1973). Training is only a partial and rather trivial subset of education in general. In contrast, education is the process of formal study, instruction and interaction which effects progressive changes in individuals' knowledge, skills and attitudes (Wolman, 1973). Criteria such as attitudes, motivation for continued learning and the aquisition of interactional skills as well as increases in knowledge are important educational outcomes (Porter, 1988). As external validity increases, so do the effects of social and organizational factors.

Such an enlargement of "education" is consistent with emerging trends in cognitive psychology. In a recent article, Greeno (1989) presents three important alternative framing assumptions for the study of "thinking": 1) situated cognition, 2) personal and social epistemologies, and 3) conceptual competence. Situated cognition suggests that cognition (thinking, knowing, and learning) is a dynamic process involving the relationship between sentient agents and their immediate social and physical environments. From this perspective, classmates become much more central to education. Greeno also presents evidence that informal theories about education (personal and social epistemologies) strongly affect individuals' acquisition of knowledge and skills. Dweck (1983) showed how childrens' beliefs about intelligence influenced their orientation to education as well as their classroom benaviors. Greeno's (1989) final assumption, conceptual competence, suggests students at every level already possess relevant conceptual abilities and knowledge. Education, thus, involves the active rearrangement and elaboration of existing knowledge structures rather than the passive acceptance of new information or skills. All three of Greeno's assumptions suggest the increased importance of "group" factors to the process of education.

Education Groups: Why?

There are many reasons to suppose groups might facilitate education. Groups seem to be good for people; they directly satisfy a variety of human needs and can provide essential emotional support for students. Groups are a forum in which students actively engage each other as well as the material. Groups can be given tasks that would be too challenging for even the best students. Groups are vehicles for

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discipline and control as well as sources of energy and motivation. These potential benefits suggest the value of choosing to include student groups in our educational plans but there is an even more important reason. As Leavitt (1975) suggests, there simply is no choice:

> ...individual organizations must, de facto, deal with groups... Groups are natural phenomena... They can be created but their spontaneous development cannot be prevented. The problem is not shall groups exist or not? but shall groups be planned or not? If not, the individual organizational (or educational) garden will sprout groupy weeds... By defining them as weeds instead of flowers, they shall continue... to be treated as pests, forever forming informally and irrationally to harass and outgame the planners. (p. 399-400)

Even if no provision is made for groups in course syllabi, students interact frequently in both formal and informal settings. Students can't help becoming members of groups. Groups already strongly influence the behavior of both students and faculty. Because such influences were not planned, even their most obvious and odious effects go unrecognized. Before suggesting alternatives, it's important to appreciate how groups influence their members.

The development and enforcement of group norms are important examples of social influence. Norms are informal rules (implicit as well as explicit) which guide group members' behavior. Norms reflect the prevailing social epistemology (i.e., accepted beliefs about the way things are). Norms are communicated and enforced informally but adherence to norms is so important it can become the sine qua non of group membership. The particular norms a group adopts incorporate the values and beliefs of individuals but also are influenced strongly by members' shared perception of their immediate organizational environment. If the environment is seen to be hostile, defensive norms are likely. On the other hand, if the environment is seen as being positive but challenging, then cooperative, mutually supportive norms are more likely to be adopted.

Even in the most homogeneous groups, all members do not act in the same way. The ways in which individual members are expected to act differently are reflected by individual "roles", another important mechanism of social influence. Roles help groups work together more efficiently by allowing group members to develop specific expectations of each other's behaviors in particular situations. Roles within groups can be a source of security and satisfaction for role incumbents. Roles can also have negative effects. An individual who acquires a high degree of skill in a particular role may discourage other members from gaining that skill (e.g., leadership). On the other hand, negative roles such as "class clown", "village idiot" or "scapegoat" can prevent the group from performing well or accepting responsibility for its failures. Obviously, these roles also have rather negative effects on their incumbents.

Both norms and roles develop gradually, changing so slightly neither students nor faculty are likely to notice differences. Group expectancies are communicated with extreme subtlety. In fact, many social rules lie below members' conscious awareness. Patterns implied by behavioral consistencies of group members (implicit norms) may be vehemently denied when publicly presented. Despite gradual development and subtle enforcement social influences are powerful and pervasive. Virtually every educationally-relevant behavior is affected by norms and roles of extant student groups.

Education Groups: How?

In writing about higher education, Peter Drucker (1989) suggests "It is time now to worry less about convergence toward uniformity and standardization and more about generating innovative divergence" (p. 50). Activities in the Department of Behavioral Sciences and Leadership of the Air Force Academy illustrate Druckers' suggestion. Systematic efforts to combine what is known about work groups with what is known about education have generated several interesting and potentially viable pedagogical alternatives. An initial, common and important task was to develop reward structures where improvement in overall class performance would be valued by individual students. Within such interdependent environments, efforts were made to influence group norms so students would view academic tasks as challenging opportunities rather than ego-threatening ordeals. As Dweck (1933) found, students who view intelligence as a flexible quality which is enhanced by learning experiences are more likely to interact with classmates and positively engage academic tasks. Attempts also were made to establish collegial rather than adversarial relations between faculty and students. This general approach has been applied in a variety of ways. The next few paragraphs describe some techniques in detail.

The effects of interpersonal factors on individual education are clearly manifest by "small groups". This category includes groups ranging in size from two to six students. Some small groups were informal, being put together for a short discussion or problem solving activity and then disbanding before the end of the class session (i.e., "buzz groups"); other groups lasted throughout the semester. Across a variety of tasks, our most effective small groups seemed to share several common characteristics. The ideal group had three members; dyads didn't generate enough energy; groups of four became lethargic (either from excessive balance or acrimonious deadlock); and groups of five diffused responsibility too widely for individual accountability. In most cases efforts

were made to equalize the "average academic potential" of groups in a class. Considering the many possible groupings allowed average group GPAs for all three-person groups to be brought within a range of .10.

Maximizing heterogeneity within groups was another common goal. Cadets from different years were put in the same group whenever possible. Women and minority students (about 20% of the Cadet Wing) were spread among different groups rather than allowed to form their own separate groups. In fact, the effectiveness of most self-selected groups was generally low. Some very successful small groups even were selected to maximize within-group differences on three of the four personality dimensions of the Myers Briggs Personality Type Indicator. Groups that were together long enough to stabilize patterns of interaction developed much greater capacity than did ad hoc ephemeral groupings. Establishing formal, enduring groups encouraged students to consider group issues seriously and work toward long term solutions rather than quick fixes to interpersonal conflicts. Top students were less willing to shoulder all the responsibility if they realized the group would accomplish many tasks throughout the semester.

Our small groups undertook a variety of tasks. Groups are capable of not only much more but much better work than individuals. For questions with convergent solutions (there is "one right answer"), standards of accuracy can be more exacting. For questions requiring divergent solutions, groups are more willing and capable of producing quality responses. Focussing on questions to which faculty don't already possess "approved solutions" helps to decrease perceived differences between teachers and students so more collegial relations can develop. This steers the class toward participative discussions and away from didactic faculty recitations. Small groups often accepted responsibility for making presentations and leading class discussions. Some small groups studied together. Restricting access to information, so each group member could directly review only part of the necessary material imposed interdependence. Although this technique is more easily applied to elementary school tasks (Johnson, Johnson and Holubec, 1986), the "jigsaw" technique can be adapted to fit some college-level tasks with little difficulty. Rarely, students were given "group tests".

Rewards for small groups varied a great deal. Giving each student the same grade for a project or test was used frequently. Less often, a total number of points were given to the group and then the points were allocated by the group to reflect the relative contributions of each group member. This approach usually involved more time and trouble than its educational value warranted. Non-grade rewards (e.g. a bag of "Snickers", pizza coupons, or dinner at a teacher's home) have all proven to be effective motivators as well.

Many educational benefits can be derived from small groups. However, unhealthy competition between groups can develop. Many of the negative, avoidant and discouraging behaviors displayed by individuals in overly competitive classes also can be observed between small groups. In our most successful interventions, students appreciated and encouraged the academic progress and achievement of all their classmates, not just those in their particular small group. Reassigning groups is one way to increase commitment to the whole class. However, there is much to be gained by allowing groups to mature. Each reassignment forces the new groups to reinitiate the development process. Two techniques were particularly useful in reaping the pedagogic benefits of small student groups while avoiding the detrimental effects of negative inter-group competition. These are the introduction of section bonus points and the creation of expanded interdisciplinary sections.

The introduction of section bonus points is a relatively minor adjustment to the course's reward structure. The mechanics of bonus point systems are relatively simple but because of their novelty, it often took several explanatory cycles before students understood them. First a challenging group goal was set. Ideally, experienced educators should set group goals through their understanding of equitable academic standards and the course material. Realistically, historical grade data and externally referenced performance norms provide useful anchor points. It's also possible to use the average performance of a reference group (e.g., students enrolled in the same course not being graded interdependently). However it is established, the target score becomes the basis for evaluating the group's overall performance. The group's performance is the arithmatic mean of all the individual student's performances on the test. In most cases, students accomplished the objective tests independently. If the group's mean exceeded the target, some portion (typically one half) of the difference was added to each individual's score. Although points could have been deducted if the group's mean fell below the target, this negative contingency generally was avoided. Not achieving their goal and thus missing the opportunity to enhance their individual scores was seen by students as an aversive outcome. Taking additional points away could have soured the relationship between the teacher and students and also generated destructive group processes (i.e., revolt, scapegoating, withdrawal, etc.). It was important that the class recognized that students who were at the lower end of the distribution were the ones with the greatest potential to increase the group average (i.e, statistical leverage). These students missed questions patently obvious to nearly everyone else in the class.

Another way to increase identification with the whole group is to expand its temporal and functional boundaries. The InterDisciplinary

Education at the Academy (IDEA) program did this by assigning the same section of students to two different courses. This had a number of interesting effects. Students were together for a longer period of time. Seeing each other in different situations accelerated the growth and increased the depth of interpersonal relations. Students were often surprised by their different roles in the two courses. This was particularly true if the two courses differed greatly from one another (e.g., psychology and physics). Through this program, even faculty members tried out new roles as students in the other course. By participating in the course from the other discipline, they provided students with a model of a master learner. This greatly reduced the perceived distance between faculty and students as well as generating extremely active and productive class discussions.

Results

Many separate interventions involving dozens of instructors and hundreds of students over the last three years have incorporated this approach. Each intervention was somewhat unique. Different combinations of techniques and self-selected volunteer instructors already biased toward collaborative learning confounded any single intervention or class well beyond the limits of empirically tolerable deviance. In fact, our educational goal could be viewed as an instantiation of the Hawthorne Effect (i.e., we wanted students as a group to feel special, work harder and perform better). Despite these weaknesses, considerable supportive evidence has accrued.

As with any program of research, there were treatments that failed. Approximately 25 percent of the experimental sections fell into this category. It's important to note, however, that in no case have we observed general or serious harm being done to either students or faculty members as a result of this program. The failures were simply cases where the time and effort of incorporating groups into the course planning did not produce the desired results. Even in groups where interventions worked well overall, there was often a minority (i.e., 5 to 20 percent) who remained reticent toward group work at the end of the course.

Interventions which involved the creation of new and unique course syllabi were very difficult to evaluate in terms of student performance because there was no clear basis for comparison. However, many of the treatments occurred in single sections of large courses in which the experimental section took the same objective multiple-choice tests as other sections in the course. The distribution shift shown in Figure 1 reflects the average performance effects observed in 14 sections in 7 different courses in which successful interventions occured. (There were 5 instances involving control group comparisons where the interventions did not produce significant results.)

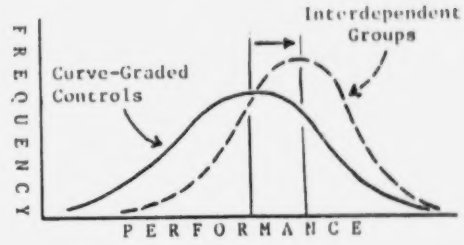

Figure 1. General Effects of Collaborative Learning on Student Performance.

Two characteristics of the shift in performance are significant. First, the overall distribution is shifted about one half standard deviation in the positive direction. (These curves represent changes before bonus points were added to individual scores.) An equally important effect is the reduction of the distribution's standard deviation by about 30 percent (which means variance was reduced by 50 percent). Inspection of the two distributions shows that both effects are caused by the below average students in the experimental groups improving their performance. At first, the lack of improvement in above average students is a little disappointing. However, two important considerations dampen this disappointment. Many objective tests are designed to have mean scores of about 80 percent and standard deviations of about 10 percent. In these cases, ceiling effects may prevent students who are already performing near the 90 percent level from improving very much. It is also possible improvements made by these students are more qualitative than quantitative. Although there was no way to unequivocally establish performance standards for unique courses, subjective evaluations by course directors and other senior faculty have consistently suggested similar positive shifts in performance.

Another source of evaluative data is the End of Course Critique given to every student in every course taught in the department (n=1600 each semester). Last fall, four sections of Behavioral Science 310 (Leadership Theory and Practice) were combined with four other courses under the IDEA program. Four different instructors volunteered to teach these sections. Approximately 330 students in 22 other sections enrolled in this course served as a control group. Two of the four experimental sections followed the same syllabus as the control group and used explicit interdependent grading systems to encourage group development. On all five common graded evaluations one of these two experimental groups achieved the highest section average among the 24 sections in the course. The two other experimental sections used a separate syllabus and texts thus their performance could not be compared directly to the control group.

The departmental course critique was common to all four experimental sections as well as students in the control group. Data from the

four experimental groups were combined and compared to data from the twenty-two other sections. Although critique responses were generally higher for the IDEA sections, the pattern of results is even more interesting than the overall effect. Two of the five criteria ("I'd like to take another course with this instructor" and " My grade fairly reflects my effort") did not differ significantly between the experimental and control groups ($t(52)=.18$ and $t(52)=1.06$ respectively).

Differences in two other criteria ("I actively participated in this course" and "I think differently after completing this course") were very significant ($t(52)=3.57$ and $t(51)=3.54$, respectively). The greatest difference in the groups, however, was in students' endorsement of the statement "This course required more of me than I expected" ($t(52)=6.29$). This pattern suggests the greatest perceived effect of the group interventions was on students' involvement and activity rather than their enjoyment. Another part of the critique asked students to use a 9-point scale to rate the course's contributions to three distinct outcomes: personal enjoyment, critical thinking and subject knowledge. Also students were asked to identify the contributions of a number of other specific factors (e.g., text, test, projects). The two factors of particular interest here are "instructor" and "classmates". Pooled raw means for the four IDEA sections and the rest of the course are shown below.

Mean Outcome Contribution Ratings for IDEA and Control groups.

Groups	Outcomes		
	Personal Enjoyment	Critical Thinking	Subject Knowledge
IDEA (n=53)			
Course	7.82	7.14	7.85
Instructor	8.29	7.51	8.16
Classmates	7.74	7.18	7.22
Control (n=337)			
Course	6.79	5.78	6.41
Instructor	7.57	6.61	7.38
Classmates	6.95	5.48	5.85

The perceived contribution of the overall course to each outcome was significantly higher for the IDEA sections than for the control sections ($t(52)=4.81$; $t(50)=6.52$ and $t(51)=6.97$, respectively). Students' perception of IDEA instructors' contributions to each outcome were significantly elevated (enjoyment $t(52)=2.54$; thinking $t(50)=3.36$ and knowledge $t(51)=2.76$). However, the greatest differences relative to students in the control group were observed in students' ratings of their own classmates (enjoyment $t(52)=2.83$; thinking $t(51)=6.19$ and knowledge $t(52)=4.95$). All students viewed one another as sources of enjoyment in their classes, what differed about the IDEA sections was that students saw their classmates (and hopefully themselves) as viable contributors to knowledge and skills.

Collectively these data suggest students in the IDEA sections worked harder and performed better than students in the control group. The pattern of responses suggests that the greatest changes occured in students' commitment to the class rather than in their personal enjoyment. Students saw their classmates rather than their instructors as the principle cause of these positive changes. As supportive as these results are, they do not reflect the qualitative changes. During the Spring term, 1987, three sections of Behavioral Sciences 110, General Psychology were allowed to use interdependent grading schemes. One of these sections was also combined with the introductory Physics course under the IDEA program. Performance improvements similar to those noted earlier were observed. The following selected qualitative student endorsements relate some of the feelings not reflected by the numeric data:

"The class is different than anything I've had before. The grading system is truly new to me. It's the first time I've had a class where you can actually, legally help each other..."

"Your classmate is a very important source of information for one main reason: he is the same age as you and has more similar thoughts and values compared to your teacher or the author of the text."

"Last week, I asked a question in class that turned out to be on the quiz. It made me feel good..."

"I noticed an attitude developing in the class that I had never seen anywhere else. Everyone had prepared for the quiz, but not just for themselves. They had also prepared for each other because they didn't want to be the one to bring down someone else's grade..."

"Looking back on it, my selfish attitude at the beginning of the course has now changed dramatically. I see a special togetherness when we study together. WE no longer are separate individuals cramming to benefit ourselves, but rather a section."

Conclusion

Education is a team sport. Both the process and the love of learning are fundamentally social phenomena. It's time to recognize this and actively work to develop ways to constructively incorporate groups in planning our curricula. Our ignorance of group dynamics caused us to employ educational standards and practices which established counterdependencies among students and adversarial relations between faculty and students. We can no longer simply blame our students for playing the games we created. We now must work with students to create better educational systems for us all.

NOTES: Views expressed here do not necessarily reflect those of the USAF Academy or any other government agency. References and additional student endorsements are available upon request.